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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|-----------------------------|------------------------|
| 10/791,428 | 03/02/2004 | William S. Wheat | 8540G-83/COB | 5404 |
| 27572 7590 07/16/2007 HARNES, DICKEY & PIERCE, P.L.C. P.O. BOX 828 BLOOMFIELD HILLS, MI 48303 | | | EXAMINER YUAN, DAH WEI D | |
| | | | ART UNIT 1745 | PAPER NUMBER |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/791,428

Applicant(s)

WHEAT ET AL.

Examiner

Dah-Wei D. Yuan

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on 09 May 2007.

2a) ☐ This action is **FINAL**.

2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 23-46 is/are pending in the application.

4a) Of the above claim(s) 35-46 is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 23-34 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☒ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on 02 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some * c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 03022004.

4) ☐ Interview Summary (PTO-413)

Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

FUEL CELL ENERGY MANAGEMENT SYSTEM FOR COLD ENVIRONMENTS

Examiner: Yuan

S.N. 10/791,428

Art Unit: 1745

JULY 6, 2007

Election/Restrictions

1. Applicant's election without traverse of Group I, claims 23-34, in Paper filed May 9, 2007 is acknowledged. Therefore, claims 35-46 are withdrawn from consideration.

Specification

2. The continuation of application filed on 3/2/04 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no continuation of application shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: a controller that controls said hydrogen supply and said air supply to power said heater to warm said fuel cell stack and said water supply while said fuel cell system is not supplying power to a load.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 23-34 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the

invention. The recitation "a controller that controls said hydrogen supply and said air supply to power said heater to warm said fuel cell stack and said water supply while said fuel cell system is not supplying power to a load" is not disclosed in the instant specification. If applicant believes said limitation is fully defined, it is requested that applicant indicates column and line, and/or figure with number, identifying the support of the recitation.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 23,24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roberts (US 6,479,177 B1) in view of Ernst et al. (US 6,489,048 B1).

Roberts et al. teach a fuel cell system that has an improved cold start capability.

Specifically, the fuel cell system comprises (a) solid polymer electrochemical fuel cell stacks (210), (b) a pressure regulator (231), i.e., blower, for an air supply, (c) a coolant water loop (240), i.e., water supply, where water is pumped from reservoir through the stack by a pump, (d) a hydrogen supply (220), (e) a hydrogen pressure regulator (221), i.e., hydrogen supply valve, (f) a variable load (216) (heater), which is connected to an output of the fuel cell stack. See Figure

3. After shutting down the operation of the fuel cell stack, i.e., the fuel cell system is not supplying power to a load, the reactant flow passages contain moist gases. Before decreasing the

stack core temperature below the freezing temperature of water, the reactant and coolant water passages within the stack are purged by circuiting dry, compressed air through them. When circulation of hydrogen and air through the stack is commenced at a stack core temperature of -11°C , the open circuit voltage is normal. A load of 360 amp is then connected in the circuit to cause the stack core temperature to rise rapidly. Once operation of the stack is commenced, the exothermic reaction of hydrogen and oxygen within the stack and the resistive heating due to internal ohmic losses cause the stack core temperature to rise. Figures 4 and 5 are composite plot of fuel cell stack voltage versus time and fuel cell stack core temperature versus time for a 10-cell stack and 4-cell stack at a core temperature below freezing temperature. It is shown that the application of 360 amp on the variable load leads to a rise of the stack core temperature by about 15°C . It is evident that the variable load (216) functions as a heater that provides thermal energy to the fuel cell system. See Column 8, Line 30 to Column 9, Line 26. Roberts et al. do not specifically disclose the presence of a controller in the energy management system for the fuel cell system. However, it is the position of the examiner that such controller is inherent, given that both Roberts et al. and the present application utilize similar operation procedure and control sequence to operate the fuel cell stacks when they are cold. Also, a controller would be essential to monitor and regulate the resulting stack voltage and temperature history as shown in Figures 4 and 5. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature *is necessarily present in that which is described in the reference*. In re Robertson, 49 USPQ2d 1949 (1999).

However, Roberts et al. do not teach the use of a heater to warm the water supply. Ernst et al. teach the use of a heater in a fuel cell system when the power decreases below a predetermined threshold. In particular, Ernst et al. teach the use of a heater (150), which is connected to the output terminal of the fuel cell stack, to provide thermal energy to the de-ionized water that flows to the water tank (102). The additional thermal energy can keep water in the tank from freezing because the fuel cell system may be located in a climate that have temperatures below the freezing point of water. See abstract, Column 5, Lines 23-34. Therefore, it would have been obvious to one of ordinary skill in the art to also include a heater to provide thermal energy to the water supply of Roberts et al., because Ernst et al. teach the importance of keeping the water supply above the freezing temperature in a cold climate.

7. Claims 25,26,29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roberts et al. (US 6,479,177) and Ernst et al. (US 6,489,048 B1) as applied to claims 23,24 above, and further in view of Manery (US 2003/0022031 A1).

Roberts et al. and Ernst et al. teach an energy management system for a fuel cell system as described above in Paragraph 6. However, Roberts et al. and Ernst et al. do not disclose the use of various sensors in the fuel cell system. Manery teaches a fuel cell system comprising a microcontroller (40) that receives various sensor measurements such as ambient air temperature, fuel pressure, hydrogen concentration, oxygen concentration, fuel cell stack current, air mass flow, cell voltage check status, voltage across the fuel cell stack and voltage across the purge cell portion of the fuel cell stack. See Figure 3. In a starting state, the microcontroller initializes

itself, places all actuators and control devices in their proper initial states, enable a serial interface, starts a watchdog timer, and performs a series of checks to ensure that all systems and components are operational. If the outcomes of the checks are satisfactory, microcontroller causes the external load to be connected and enters a running state, otherwise fuel cell system enters a failure state without becoming operational. In particular, hydrogen pressure sensor (62), fuel cell stack temperature sensor (SI), ambient temperature sensor (S10), temperature sensor (S1) in a humidity exchanger that provide water to the membrane of the fuel cell, hydrogen concentration sensor (S5), hydrogen sensor check sensor (S11), hydrogen heater current sensor (S6) are used in the system. See Paragraphs 47,48,51,52,53,54,68. Therefore, it would have been obvious to one of ordinary skill in the art to add various sensors, including hydrogen pressure sensor, stack temperature sensor, ambient temperature sensor, water tank sensor, to the fuel cell system of Roberts et al. and Ernst et al., because Manery teaches the combination of microcontroller and different sensors to help monitor and regulate the operation of the fuel cell system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dah-Wei D. Yuan whose telephone number is (571) 272-1295. The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Dah-Wei D. Yuan
July 9, 2007



DAH-WEIYUAN
PRIMARY EXAMINER